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(54) **Locking device for tools**

(57) The locking system comprises a locking device (1) which consists of two side parts (2—3 and 5) made of metal and an intermediate part (4) made of an elastic, easily deformable material. The locking device side part (5) functions as a locking latch and when fitted it bridges the distance between a locking surface (17) on a replaceable wear part (13) on e.g. earth moving machine tools and another locking surface (18) in its holder (14). A special mandrel, for removing the locking device (1), is provided and is pointed at one end and can be rotated in the opening (23). Both the periphery of the mandrel and the neighbouring surface (6) of the locking device are equipped with a friction increasing pattern. By entering the mandrel completely into the opening (23) the locking device (5) is pressed away from the locking position (18) and by rotating the mandrel the locking device can be fed out of the locking position.

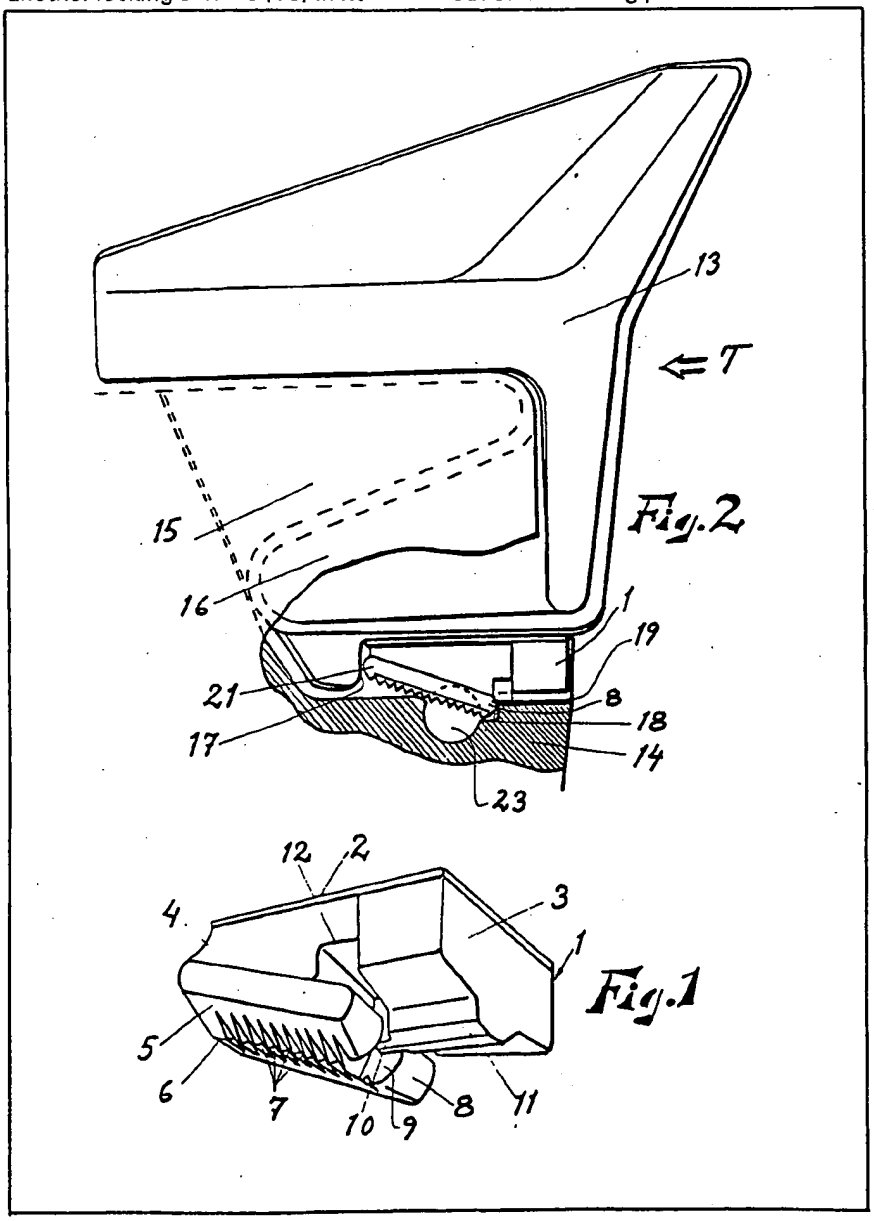

Fig.2

Fig.1

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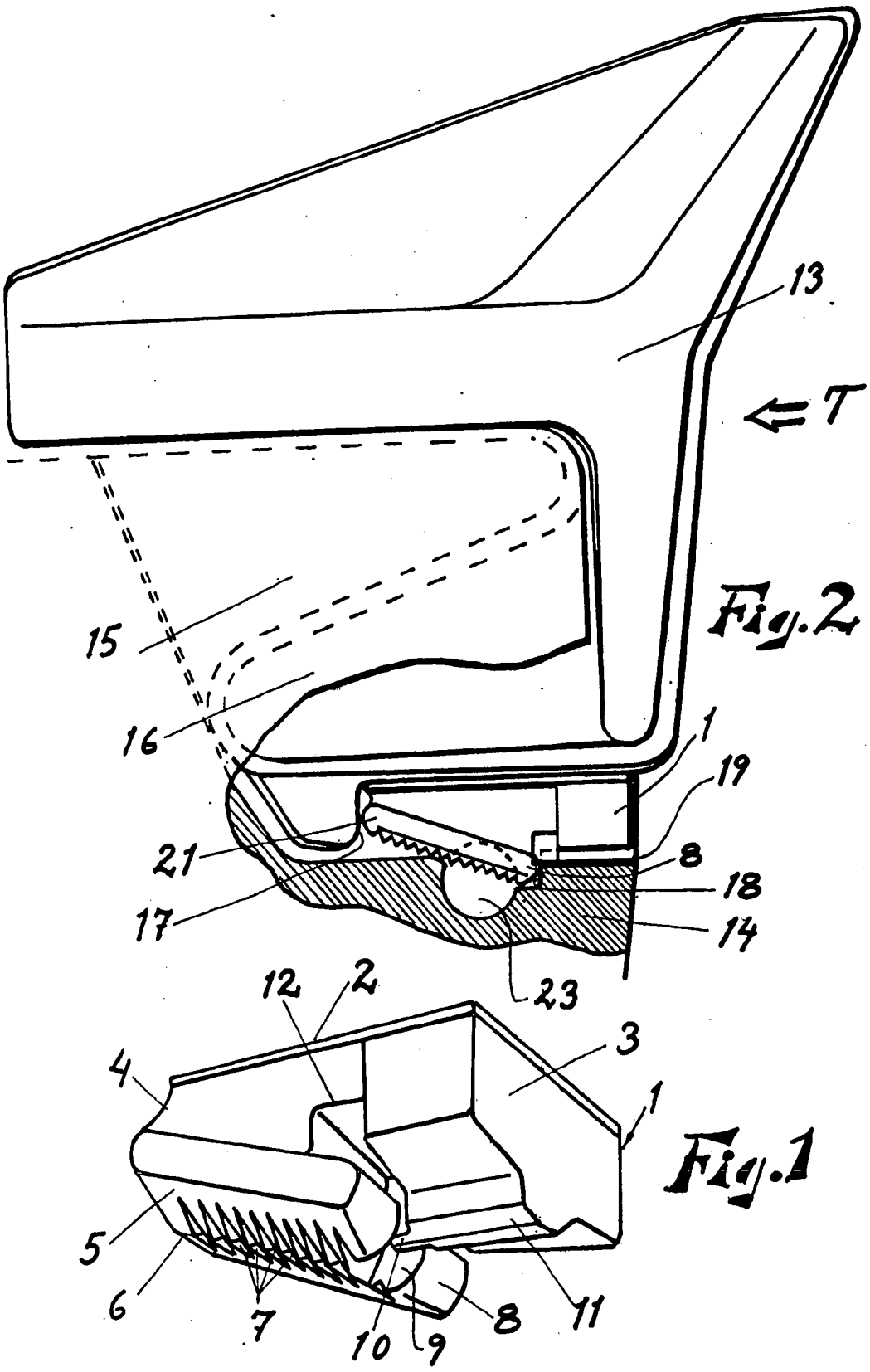

Fig.2

Fig.1

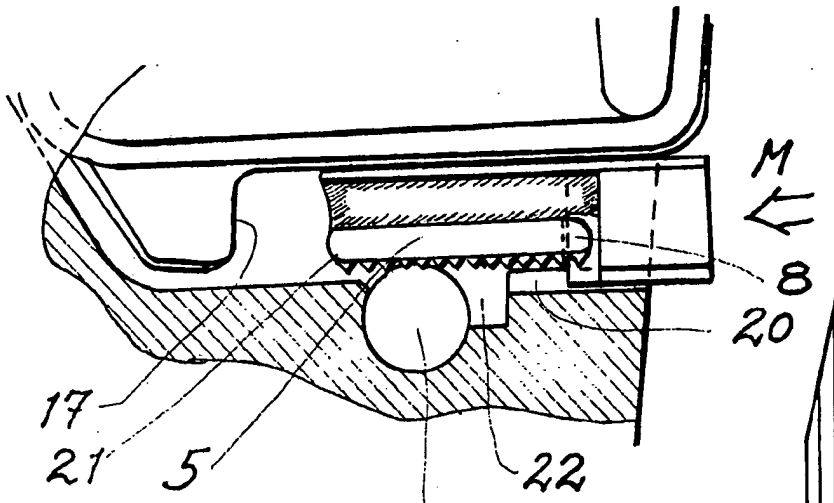

Fig.3

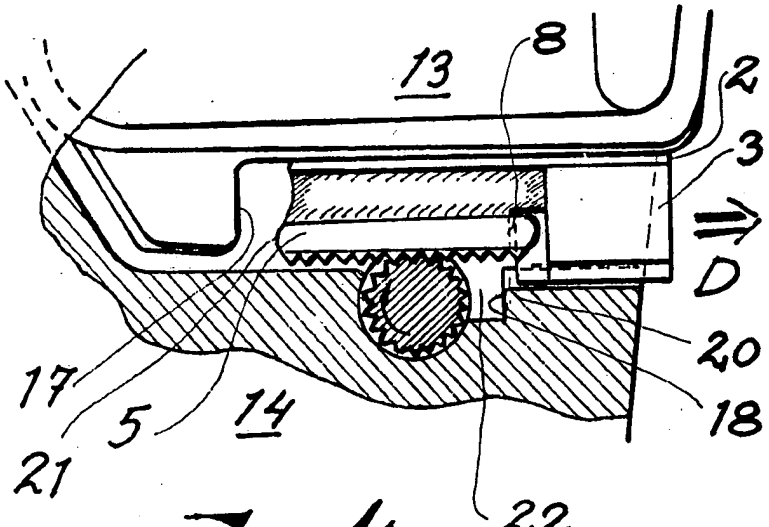

Fig.4

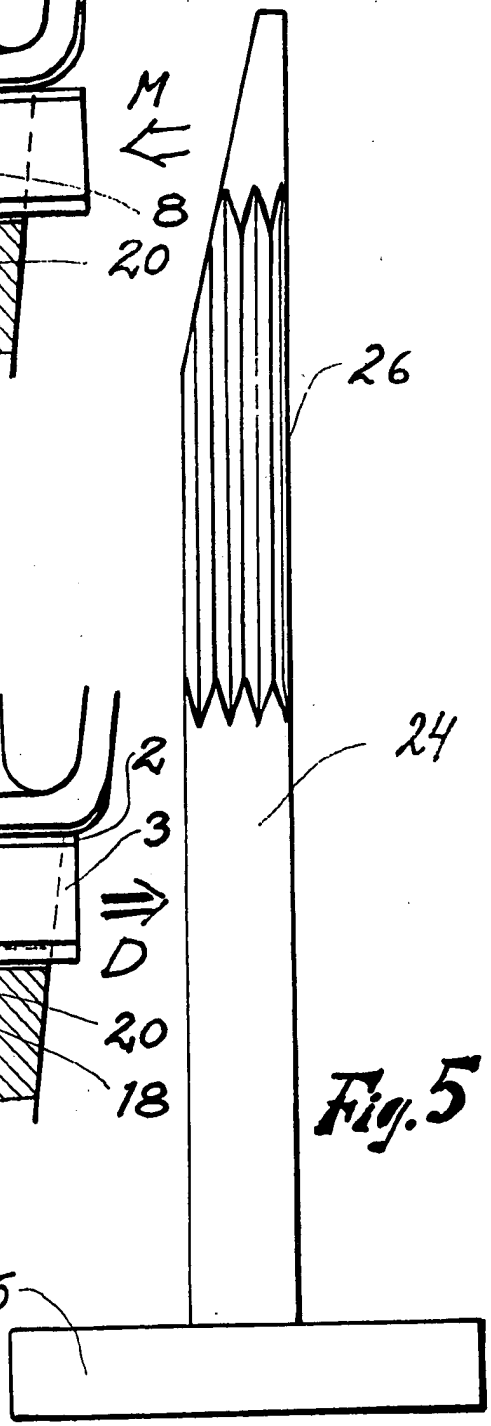

Fig.5

SPECIFICATION

Locking system for replaceable wear parts for earth moving machine tools

This invention relates to a locking system for earth moving machine tool wear parts. Commonly, such wear parts must be capable of being quickly and easily replaced even during brief pauses in working.

The expression "earth moving machine tools" includes all such tools, for example mechanical loaders, excavating machines, mechanical shovels, rotary dredging cutters, forest land ploughs, etc., which because they are normally subjected to high wear, are fitted with easily replaceable wear parts such as teeth, cutting edges, points or similar. Such wear parts may be fitted directly to the tool or via a holder of one type or another. Common to all easily replaceable wear parts is the fact that they are held in place by means of specially designed removeable locking devices.

A common basic type of locking device for replaceable wear parts consists of two, more or less, parallel metal parts joined together by means of an elastic intermediate part of, e.g. rubber, which must be deformed to permit the locking device to be fitted in place. The elasticity of the intermediate part then helps to prevent the locking device from falling out while the tool is in use. On the other hand, all greater forces to which the locking device is subjected are absorbed by the two metal parts. As a rule, this type of locking device is fitted in a hole or groove which cuts across the direction in which the wear part is fitted and removed. A representative example of this type of locking device is described in U.S. Patent No. 3879867. There are also other locking devices which although based on similar principles are fitted in the same direction as the direction of fitting and the same direction as the direction of fitting and removal of the wear part. An example of a locking device of this latter type is described in U.S. Patent No. 3,312,004. This locking device consists of an elastic cushioning part and a metal locking part. The locking part is fitted with a special locking lug intended to lock the wear part in position. A disadvantage of this type of locking device is that it is enclosed in the mounting onto which the wear part is fitted and therefore must be fitted in position before the wear part is fitted. However, the greatest disadvantage with this locking device is that it must extend outside the wear part so that access can be gained to its outer edges in order to press it down into its groove in the mounting so that the wear part can be removed.

Swedish Patent 77.09969-5 describes a locking device of another type which is fitted in the direction of fitting and removal of the wear part and which can be fitted in position after the wear part has been fitted but which must be removed before the wear part. This locking device sits well protected in a groove between the wear part and the mounting. However, as the actual locking function of this device is achieved by riveting, a heavy hammer must be available when fitting, and in addition a tapered mandrel must be available for removing the rivets when the locking device is to be removed.

No matter how a particular locking device is constructed it must be seen in context with its locking position in the wear part or holder. Together the locking device and the locking position form a locking system.

This invention provides a new locking system for wear parts for earth moving machine tools. The locking system of the invention is primarily intended for use on such wear parts as it may be desired to equip with a locking device which is to be fitted and removed in the same direction as the wear part. In particular, the locking system described in Swedish Patent 77.09969-5 can be replaced with the locking system as described in the invention. In this case it will only be the actual locking device which is altered. For other applications of the new locking system it may be necessary to alter the locking position and other details e.g., the size of the opening which, according to the invention, is used to gain access to the locking device with a special mandrel in order to remove the locking device.

Advantages of the locking system according to the invention are, for example, that the locking device is easy to fit without the mandrel specially formed for the system being available. The locking system according to the invention is also reliable as its location is well protected between the wear part and the holder for the wear part. Furthermore, the locking device can readily be shaped so that it can only be entered into the lock opening in the correct manner, a characteristic which can be of great importance in times of stress.

Broadly, the present invention provides a locking system for replaceable wear parts for an earth moving machine tool, the fitted wear part and its holder providing two shaped apart locking surfaces, one formed on the wear part and the other on said holder, the system including a locking device which is removably receivable in the space between said locking surfaces to cooperate therewith to lock the wear part and holder against relative movement, wherein said locking device comprises a latch member mounted by an elastically deformable intermediate member to a base member, and wherein said locking device is receivable into and removably from said space between said locking surfaces through deformation of its elastically deformable intermediate member, said latch member having a friction-increasing surface adapted, in the locking position of the locking device, to be accessible via an opening formed in the wear part and/or the holder to a tool introduced from the outside and to grippingly cooperate with said tool to permit said elastically deformable intermediate member to be deformed sufficiently to allow the locking device to be removed from said space between said locking surfaces with the aid of said tool.

A preferred locking system according to the

invention can be described as comprising firstly, a locking device consisting of two side parts made of metal and an elastic intermediate part, and secondly, a locking position for the locking device in the form of a groove between the fitted wear part and its holder into which the locking device can be entered by compressing the intermediate part and in which the locking device with one of its side parts functions as a locking latch and bridges the distance between the two opposite lock surfaces one of which is formed in the wear part and the other in the holder. That side part which functions as a locking latch locks the wear part and the holder relative to each other and at the same time prevents the locking device from falling out. Especially characteristic of this embodiment of the invention is that that outer broad side of the side part which functions as a locking latch which faces away from the intermediate part has a friction increasing pattern and is accessible from the outside via an opening through the wear part or the holder. By influencing the said side part via this opening with a mandrel or similar the intermediate part can be compressed sufficiently to release the side part from the locking position and the locking device can be removed. Simultaneously the friction increasing pattern makes it possible to move the locking device out of the locking position for example by turning the mandrel. The friction increasing pattern is normally formed by a series of tooth-shaped grooves placed at right angles to the fitting direction of the locking device. This is to say that the outside of the side part has the form of a geared rack. The mandrel should be provided with suitably adapted gear-shaped grooves which run lengthwise its own cylindrical outer periphery. The end of the said mandrel is pointed while the previously mentioned opening is in the form of a cylindrical hole which runs at right angles to the main direction of the locking device and is so arranged relative to the locking position that when the mandrel has completely entered the opening the intermediate part is deformed sufficiently to allow the locking device to be removed from the locking position.

In addition to the above-mentioned basic principle of the invention there are other greater or smaller but nonetheless important integral details. It was found that the intermediate part can with advantage be manufactured from an easily compressed elastic material such as foam rubber instead of the semi-hard but deformable qualities of rubber which have previously been used in locking devices for similar purposes.

It was also found to be valuable if the side parts of the locking device were made to fit in to each other for example by providing one of the side parts with groove which grips over a cam located on the other side part and along which it can be moved.

A preferred embodiment of a locking system in accordance with this invention will now be described with reference to the accompanying drawings, in which:

Figure 1 shows the locking device itself in perspective;

Figure 2 shows the locking device to a smaller scale fitted in position in a partly sectioned tooth holder which supports a tooth point;

Figures 3 and 4 show details illustrating the fitting and removal of the locking device into and from the locking position shown in Figure 2; and

Figure 5 shows a plan view of a mandrel included in the invention.

The locking device (1) shown in perspective in Figure 1 consists of a base piece (2) and firmly attached to it an end piece (3), both being made of a suitable metal. A locking latch (5), also of a suitable metal, is connected to the base and end pieces (2) and (3) via an intermediate part (4) made from an elastically deformable, and preferably also compressible material, for example foam rubber. The outward facing side (6) of the locking latch (5) is of a chamfered ridge form and in its highest part are a number of gear-shaped grooves (7) arranged at right angles to the longitudinal direction of the locking device. In the edge (8) of the locking latch (5) facing the end piece (3) there is a guide groove (9) which grips over a guide flange (10) which is formed in the end piece (3). In addition the end piece (3) is provided with a second guide flange (11) intended to cooperate with the tooth or tooth holder, as will be described hereinafter. The locking device is advantageously wedge-shaped from the end piece inwards, in order to ensure that together with the guide flange (11) it is impossible for the locking device to be entered into its locking groove between the tooth and holder in more than one way.

The intermediate part (4) is wedge-shaped inwards so that the locking latch (5) when not subject to load forms an angle with respect to the base piece (2). Thus, when the intermediate part is not subject to load the edge (8) of the locking latch facing the end piece (3) extends below the end piece. By deformation and possible compression of the intermediate part (4) the edge (8) can be moved inside the lower edge of the end piece (3). To ease this operation the intermediate part is provided with two recesses (12) (only one of which is shown in the figure), one on each side of the guide flange (10).

Figure (2) shows the locking device (1) fitted in place between a tooth point (13) and a tooth holder (14) which is only partly shown in part section in the drawing. The tooth point (13) is fitted in a groove in the tooth holder (14) in the direction indicated by the arrow T. Tooth and tooth holder cooperate together by means of a cross groove and the teeth (15) and (16) which grip into it. These lock the teeth in all directions except the removal direction which is opposite to the fitting direction T. The tooth point (13) is provided with an outward facing locking surface (17) and the tooth holder is provided with an inward facing locking surface (18). Between the tooth point and holder there is an opening (19) into which the locking device (1) can be entered in

the same direction as the tooth is fitted (marked M in Figure 3). In the bottom of the opening (19) there is a groove (20) (see Figures 3 and 4) for the locking device guide flange (11).

When the locking device is pressed into place, as illustrated in Figure 3, the limited height of the opening (19) forces the locking latch (5) up, thus deforming the intermediate part (4). The height of the opening is sufficient to accommodate the end piece (3) and the base piece (2). As the inner end (21) of the locking latch (5) makes contact with the locking surface (17) of the tooth point, (see Figure 2) the outer end (8) of the locking latch passes the locking surface (18) of the tooth holder and is pressed down by the intermediate part (4) into a locking position (22) provided for this purpose, so that it locks against this surface. In this position the locking latch bridges the gap between the two locking surfaces (17) and (18) and in this way locks the tooth point (13) in its position in the holder (14) (see Figure 2). Outwards the locking device is completely protected by the end piece (3).

For removal of the locking device there is an opening (23) provided in the holder (14). This opening runs at right angles to the fitting/removal direction. In the locked position (22) the locking latch extends across part of this opening (see Figure 1).

For the purpose of removal, the tool shown in Figure 5 is used. This tool consists of a chamfered or pointed mandrel (24) of circular cross-section. The outer end of the mandrel is provided with a hand grip (25). The mandrel fits into the opening (23) and it is also provided with gear-shaped grooves (26) which have the same profile as the gear-shaped grooves (7) in the outer side (6) of the locking latch (5).

To remove the locking device, the mandrel (24) is entered into the opening (23) and then pressed completely into the opening after which the point of the mandrel is moved in under the locking latch, thus forcing it out of the locking position (22). By turning the mandrel clockwise, as viewed in Figure 4, the locking latch is moved out of the opening (19). Figure 4 shows the movement (in the direction of the arrow D) of the locking latch out of the locking position just commencing.

The friction-increasing surfaces on the locking latch and the mandrel do not necessarily have to be in the form of geared grooves, although this is often the most advantageous form. As soon as the locking device has been removed, the tooth point (13) can be removed.

Each locking device of the illustrated type should be able to be used for a great number of tooth points.

CLAIMS

1. A locking system for replaceable wear parts for an earth moving machine tool, the fitted wear part and its holder providing two spaced apart locking surfaces, one formed on the wear part and the other on said holder, the system including a locking device which is removably receivable in the space between said locking surfaces to cooperate therewith to lock the wear part and holder against relative movement, wherein said locking device comprises a latch member mounted by an elastically deformable intermediate member to a base member, and wherein said locking device is receivable into and removably from said space between said locking surfaces through deformation of its elastically deformable intermediate member, said latch member having a friction-increasing surface adapted, in the locking position of the locking device, to be accessible via an opening formed in the wear part and/or the holder to a tool introduced from the outside and to grippingly cooperate with said tool to permit said elastically deformable intermediate member to be deformed sufficiently to allow the locking device to be removed from said space between said locking surfaces with the aid of said tool.

2. A locking system in accordance with Claim 1, wherein the locking device comprises two side parts (2—3 and 5) made of metal and an elastic deformable intermediate part (4), and wherein a locking position (22) in the form of a groove (19) for the locking device (1) is provided between the fitted wear part (13) and its holder (14) into which the locking device can be entered by means of deformation of the elastic intermediate part (4) and in which the locking device with one of its side parts (5) functions as a locking latch and bridges the distance between the two opposite locking surfaces of which the one (17) is formed in the wear part and the other (18) in the holder (14) and through which their common movement and their individual movement is prevented, said side part (5) which functions as a locking latch has an outer broad side (6) which faces away from the intermediate part and on which is formed a friction increasing pattern (7) and by means of which the said broad side (6) via an opening (23) through the wear part or the holder is accessible from the outside with the aid of a mandrel (24) with which the elastic intermediate part (4) can be deformed sufficiently to allow the side part (5) to be moved out of the locking position (22) and by gripping the pattern move the locking device (1) out of the groove (19) between the wear part (13) and the holder (14).

3. A locking system in accordance with Claim 2, characterised in that the pattern (7) of the side part runs at right angles to the lengthwise direction of the locking device (1) and is formed as a gear tooth shaped groove and which forms the outside of the side part into a geared rack and where this geared rack is accessible to the mandrel via an opening (23) which runs at right angles to the groove (19) for the locking part the said opening having a circular cross-section and where the mandrel (24) consists of a somewhat pointed in the hole (23) rotatable axle facing the side part of the locking device and provided with longitudinal grooves (26) which are adapted to the grooves in the geared rack.

4. A locking system in accordance with either

of the Claims 2 and 3 characterised in that the elastic intermediate part (4) is wedge-shaped so that the side parts (2—3) and (5) form an angle to each other.

5. A locking system in accordance with any of the Claims 2—4, characterised in that both the side parts (2—3) and (5) are made so that they fit in to each other (8—10) at least at one end of the locking device.

6. A locking system in accordance with any of the Claims 2—5, characterised in that the side part (2) which does not function as a link between the locking surfaces is formed with an end piece (3) which with the locking device in position partitions the groove from the locking device.

7. A locking system in accordance with any of the Claims 2—6, characterised in that the end piece (3) at its inward facing edge has a fold (10) to guide the other side part (5) and that its edge (8) which faces the end piece (3) has an equivalent groove.

8. A locking system in accordance with any of the Claims 2—7, characterised in that the end piece (3) is formed with a guide groove (11) and the groove (19) for the locking device with an equivalent guide groove (20) to make it impossible for the locking device to be fitted in more than one way.

9. A locking system in accordance with any of the Claims 2—8, characterised in that the mandrel (24) for removing the locking device (1) is chamfered wedge-shaped at its inner end and that its outer end is provided with a hand grip (25) for turning the said mandrel.

10. A locking system in accordance with any of the Claims 2—9, characterised in that the locking device's (1) intermediate part (4) is manufactured from a very easily compressed and elastic material such as foam rubber.

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